

**"REMOVING THE BARRIERS IN  
MANUFACTURING",**

by

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**REMOVING THE BARRIERS  
IN MANUFACTURING**

Report on the  
1990 European Manufacturing Futures Survey

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## SYNOPSIS

The 1990 European Manufacturing Futures survey shows that the European manufacturers are doing well. The efforts in total quality management and improvement of deliveries are paying off; the factories have been cleaned up and reorganized. The creation of the post 1992 single market is not expected to change the total number of their factories, but is likely to demand a more customized output and service to more markets from each factory. More non-EC competitors are expected to enter and set up plants in Europe.

The leading European manufacturers are focusing increasingly more on establishing closer links between production and the other functions in the company as well as with suppliers, customers, and others outside the company. This is done partly through technology, partly through interfunctional teams, and partly by modification of procedures. The goal is to remove the barriers to free flow of information, goods, and people to and from the factory.

This is a bold move, but as the logical next step to the improvement efforts within the factory, it is unavoidable. The excitement of the 1992 single market, and the opening of the Eastern European markets, can hinder such risk-taking ventures in manufacturing. But, in fact because of the new opportunities, uncertainties, and potential turbulence in Europe in the next few years, there is even more reason for bringing the factory in closer contact with its environment. This will be risky, but for the European manufacturers, the favorable recent results provide a window of opportunity to prepare for the factory without borders.

## INTRODUCTION

European manufacturers, as represented by a sample of 224 large European companies who responded to our 1990 European Manufacturing Futures survey (see Appendix), are doing well. Profits have increased, capacity utilisation is high, market shares are growing, and on many other indicators that reflect modern manufacturing methods, they score well. This prosperity is of course partially due to the favourable business conditions, and the expectations created by the European single market, as well as the events in Eastern Europe. But European manufacturing industry has also used the prosperity of the recent past to clean up and revamp its factories. The reorganisation of manufacturing and reconditioning of the plants have been stimulated by a strategy which has focused on improving quality of the output and dependability of the delivery.

Much of the efforts to improve total quality and other production capabilities still continue. But our sample of high performing European manufacturers seem to be looking for new ideas. The core of these new ideas appears to be better integration of the production function with the rest of the enterprise and the environment. A more systematic view of the logistics chain from supplier to final customer, a more customer-driven manufacturing, and an increased integration with other business functions have emerged as the new objectives. Achieving these objectives pose new challenges, but would lead to a more competitive manufacturing function in the coming years in Europe.

## EUROPEAN MANUFACTURERS' PERFORMANCE

Most of the 224 business units in our sample are doing quite well. The average pre-tax return on assets for the last fiscal year was 17.8%, average unit growth rate was 13% and capacity utilisation was increased to 84.3%. These good results are surely due in part to better performance of manufacturing. Indeed, as shown in Table 1, most of the respondents report improvements in many specific manufacturing performance indicators.

<b>TABLE 1 : MANUFACTURING PERFORMANCE INDICATORS</b>			
INDICATOR	1985-1987 Average improvement (%)	1987-1989 Average improvement (%)	1987-1989 % of respondents reporting improvement
Outgoing quality		15	83
Inventory turnover	13	15	68
On time delivery	8	15	64
Return on manufacturing assets		15	78
Customer service		14	78
Overall quality	9	13	76
Manufacturing lead time		13	67
Set-up times		12	63
Variety of products		12	60
Market share		11	62
Delivery lead time	8	10	57
Average unit cost	0	8	62
Speed of new product development	6	8	50
Procurement lead time and		8	55
Profitability		28	72

Both the average performance improvements and the proportion of business units that have improved their performance on the different indicators are impressive. In particular, the improvement in profitability is spectacular. And the average 15% improvement of outgoing quality, inventory turnover, on-time delivery and return on assets employed in manufacturing, is impressive. More than 80% of the respondents report an improvement in outgoing quality. **This shows that the efforts in quality improvement which we noticed in 1988 seem to pay-off (De Meyer and Ferdows, 1988).** (1) 1) Though delivery and procurement lead times, unit production cost and speed of new product development have also improved, these indicators lag in comparison to the other ones.

The quantitative evaluations of the improvement are backed up by the qualitative perceptions of the strengths and weaknesses with respect to competitive abilities. Out of a list of 15 possible competitive abilities related to price, flexibility, quality, delivery and service, the respondents considered their business units to be stronger than their best competitor on their ability to offer consistently low defect rates, to provide high performance products, and to provide reliable durable products. They felt, however, weaker on their ability to compete on price, to introduce new products quickly, and to make rapid design changes.

Combining the quantitative and the qualitative evaluations it seems that the European manufacturers have made considerable progress in terms of profits, quality and delivery. Progress in flexibility has been made, but not in sufficient amounts to catch up with their best competitors.

### **ACTION PROGRAMMES WHICH HAVE PAID OFF**

The improved performance of manufacturing must have resulted mostly from successful implementation of specific action programmes. We asked the respondents to indicate the action programmes which they had emphasized in the last two years and their payoffs. The list we supplied them included 26 programmes. In Table 2, we show the top ten programmes which received most attention and top ten programmes which had the greatest payoffs; also in Table 2 we show the bottom five programmes in each category. The highest pay-off comes from **structural changes** in manufacturing: reorganising manufacturing, closing or relocating plants (when necessary), reconditioning of the physical plant and investing in new processes. The favourable economic environment has allowed these Europeans to revamp the facilities. Given the positive perception of the pay-off of these actions, we conclude that the increased productivity and profits are foremost due to these structural changes.

Immediately below these structural programmes, we find a set of four other programmes **which focus on reaching out beyond the factory borders**. Quality function deployment ("a set of techniques for determining and communicating customer needs and translating them into product and service design specifications and manufacturing methods") brings the customers' voice into the plant; linking manufacturing to the overall business strategy, and interfunctional workteams integrate manufacturing with the other company functions. And since the successful implementation of just-in-time requires a close collaboration between the company and its suppliers, the high payoff of this programme hints at a successful upstream integration.

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(1) De Meyer & Ferdows, "Quality Up, Technology Down", *IJTM*, Vol. 5, Nos. 7/8/9, 1990.

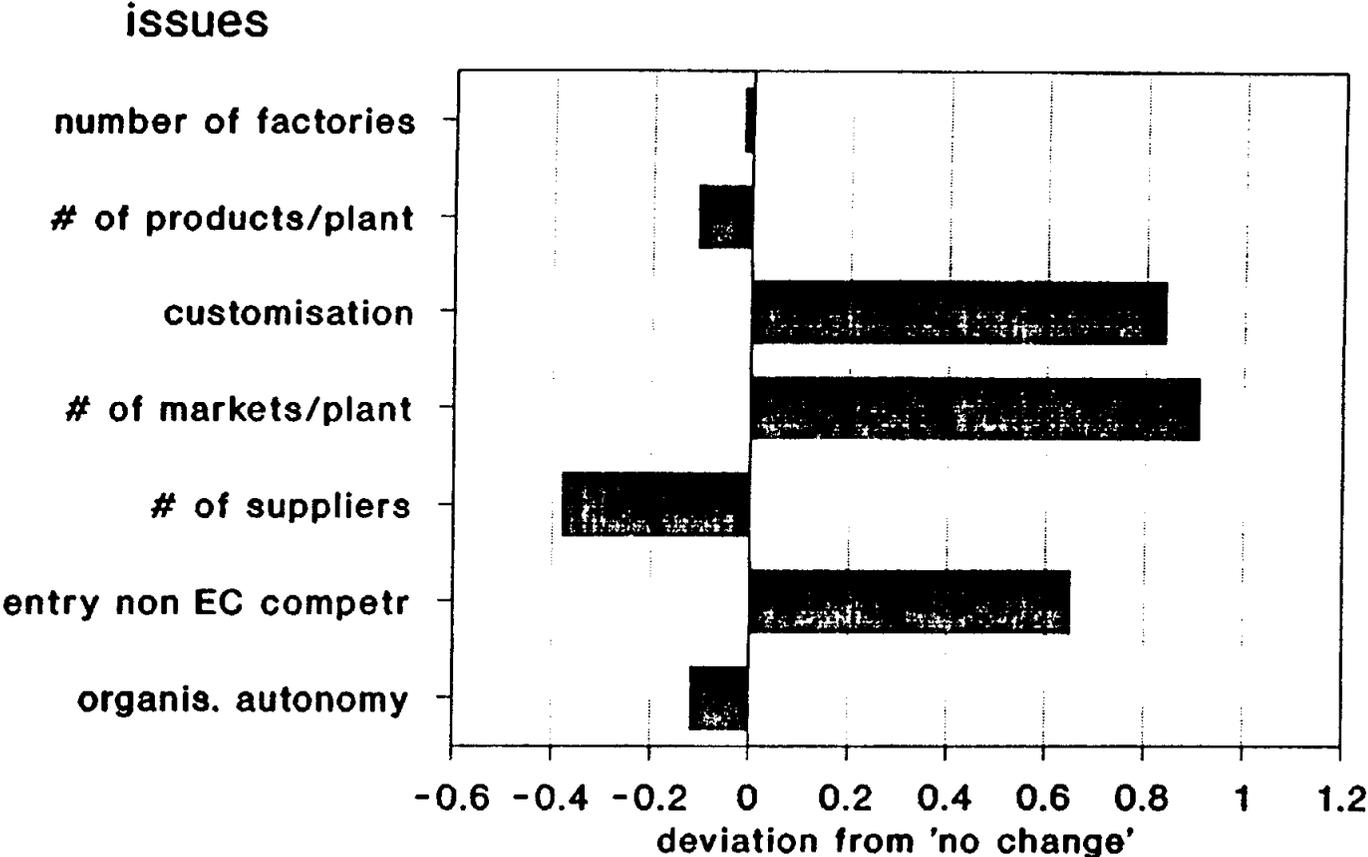
<b>TABLE 2 : PAST ACTION PROGRAMMES AND THEIR PAY-OFF</b>	
<b>Programmes emphasized (1988-90)</b>	<b>Payoffs</b>
<b>Top Ten</b>	<b>Highest Ten</b>
Worker training Integration of information systems in manufacturing Management training Manufacturing organisation Supervisor training Quality function deployment Link manufacturing to business strategy Integrating information systems across functions Giving workers a broader range of tasks/responsibilities	Manufacturing reorganisation Closing plants Develop new processes for old products Reconditioning plants Develop new processes for new products Quality function deployment Link manufacturing strategy to business strategy Just-in-time Interfunctional teamwork Supervisor training
<b>Bottom Five</b>	<b>Bottom Five</b>
Value analysis/redesign Closing plants Activity based costing Design for manufacture Robots	Giving workers a broader range of tasks Production planning and inventory control system Integrating information systems across functions Quality circles Activity-based costing

The list of the five action programmes which were implemented in the past and which have, relatively speaking, the lowest pay-off is a mixed bag. Some of them, like integrating information systems across functions have been heavily emphasized in the last two years. They probably haven't paid off yet. Others like activity-based costing are still unknown. Still others may have turned sour. Quality circles, in particular, which were very popular in previous surveys, might be among them.

### **ENVIRONMENTAL PRESSURES**

One of the major issues which looms on the horizon of Europe's industrial environment is the creation of the single market by January 1993. How will the single European market influence manufacturing? In Figure 1, we show the expected changes for seven key issues. Product customisation and the number of markets served by each factory will increase. Furthermore, the number of non-European competitors entering the EC market is expected to grow. On the other hand, the number of suppliers will shrink. The single market seems to have only a minor impact on the number of factories, the number

**FIGURE 1:  
EXPECTED INFLUENCE OF 1992 ON PRODUCTION**



of models produced per factory, or the organisational autonomy of the factories. In other words our respondents expect that their factory network will be simplified: the same number of factories, but more markets served by each factory, without increasing the product range, and that with less suppliers. This can only be if these factories specialise in a few products, which they produce for the whole of Europe as opposed to a single national market. This pan-European market will, however, require more customization of the basic product.

We also asked our respondents to rate themselves against their best competitor in their ability to predict product, process and market changes. European manufacturers single out one issue where they think they have more difficulties than their best competitors: the ability to cope with faster changes in products. On the contrary they think they have less difficulties than their competitors in estimating the process characteristics, and in their ability to attract capital resources for investment. This is partly explained by the sample: large manufacturers have perhaps less difficulty in obtaining capital resources, and have enough in-house know-how to estimate their process capabilities. But why they would have more difficulties to cope with faster changes in products is somewhat of an enigma. But why should they feel inferior in coping with product changes? Is it because coping with fast product changes necessitates crossing functional boundaries, a cumbersome move in large organizations?

Many of our respondents, though located in Europe, operate globally. Do they, and the rest of the sample, see a shift in production, sales, and procurement in 1992? As shown in Table 3, no big changes are expected in the short term in the geographical distribution of sales, production and purchasing patterns. This stability, particularly for sources of materials and components, indicates that the respondents do not expect that 1992 will cause a major change in the international trade patterns.

**TABLE 3 : EVOLUTION OF PRODUCTION, SOURCING AND SALES**

	production (%)		sales (%)		purchase	
	1989	1992	1989	1992	1989	1992
Europe	94%	93%	83%	80%	83%	83%
U.S/Canada	3	4	8	9	10	9
Pacific Asia	2	2	5	6	5	6
Others	1	1	4	5	2	2

## NEXT STEP: REMOVE BORDERS

The economic conditions seem favorable. European manufacturers have been able to build up a small war chest. Some action programmes have nicely paid off. The factory has been cleaned up and reorganized. So, **what is next** ? Four parts of our survey provide clues: the basic thrust of the business, the degree of importance of the competitive abilities, the manufacturing objectives and plans, and the action plans for the next two years.

More than two-thirds of the respondents intend to build market share. This is a clear departure from our previous surveys where the most important strategic direction was defending the market share.

This aggressive marketing plan must be reflected in continuous upgrading of manufacturing capabilities. The rank ordering of the importance of 14 different capabilities shown in Table 4 indicate the general direction of the efforts. As in previous years European manufacturers stress the need to offer total quality: reliability and durability, consistency in low defect rates, production of high performance products, effective product support, good after-sales service and dependable deliveries are all ranked high. Next comes the ability to customise products. Flexibility in design, volume, mix changes, and the ability to introduce new products are at the bottom of the list. Also the ability to compete in price competitive markets does not rank high. Broadly speaking, the average European manufacturer's sequence of priorities are: quality, delivery dependability, price and flexibility.

Are the differences in industries significant? We split the sample in four industry groups: consumer packaged goods, basic industries, machinery, and electronics (Table 5). There are striking similarities among the competitive priorities of these four groups. And more in-depth analysis of the differences reveals little beyond what one would expect: consumer packaged goods emphasize price a bit more than others; electronics emphasize customization more, and so on.

**TABLE 4: RANK ORDER OF COMPETITIVE PRIORITIES**  
(first is most important)

Importance of the ability to:

- Offer consistently low defect rates
- Offer dependable delivery promises
- Provide reliable/durable products
- Provide high performance products or amenities
- Offer fast deliveries
- Customise products and services to customer needs
- Profit in price competitive markets
- Introduce new products quickly
- Provide effective after sales service
- Offer a broad product line
- Make rapid volume changes
- Make rapid product mix changes
- Make product easily available
- Make rapid changes in design

**TABLE 5: FIVE HIGHEST COMPETITIVE PRIORITIES PER INDUSTRY**

Consumer packaged goods n=26	Basic industries n = 97	Machinery n = 39	Electronics n = 52
Consistency Dependable deliveries Fast deliveries	Consistency Dependable deliveries Reliability	Consistency Dependable deliveries After-sales service	Reliability Consistency Dependable deliveries
Price Reliability	High performance Fast delivery	Reliability High performance	Customization After-sales service

What kind of objectives are these manufacturers setting for themselves? As one might have expected, improving quality, reducing costs and increasing the productivity of the production process are the main themes in the top ten objectives (Table 6). Two items in the list in Table 6 go beyond the traditional borders of manufacturing. Improving vendor quality (8th in the list) requires more than the definition of specifications and standards, but close interaction with the vendors. And the improvement of interfunctional communication (5th most important objective) seems to indicate the outbound reach of manufacturing towards other functions.

How is this translated in action plans for the future? We asked our respondents to indicate the degree of emphasis they were placing on each of a list of 26 specific action programmes for the next two years. We chose the short time horizon of only two years to avoid wishful thinking. What can we learn from the ranking of the action programmes (Table 7)? **Training** is clearly a key. Training at all levels. And this seems to be more than words. The respondents estimate that 4% of their direct employees' time is spent on education and training (as compared to 65% on direct production tasks). This is about one day's training a month.

**TABLE 6: MANUFACTURING'S OBJECTIVES**

<b>Top Ten</b>
Improve conformance quality Reduce unit costs Reduce overhead costs Increase delivery reliability Improve interfunctional communication Improve direct labour productivity Increase throughput Improve vendor quality Reduce new product development cycle Improve white collar productivity
<b>Bottom Five</b>
Improve labour relations Increase capacity Increase range of products produced by existing facilities Reduce number of vendors Reduce capacity

**TABLE 7: INTENDED ACTIONS FOR THE NEXT TWO YEARS**

<b>Top Ten</b>
Linking manufacturing strategy to <b>business strategy</b> Integrating information systems in manufacturing Quality function deployment Supervisor training Worker training Integrating information systems across functions Management training Interfunctional work teams Developing new processes for new products Statistical quality control
<b>Bottom Five</b>
Quality circles Value analysis and product redesign Hiring in new skills from outside Robots Closing, relocating plants

Five action plans in the top 10 reported in Table 7 have something to do with **integration**. The link between manufacturing and the business strategy can contribute to turning manufacturing into a supportive function. Integration of information within manufacturing and across different business functions points at a horizontal integration with the rest of the company. Interfunctional work teams brings this integration to an operational level. Finally, the emphasis of the quality function deployment suggests further integration of the customer into production. The action plans which relate to the core of manufacturing such as just-in-time, production planning and control or quality control rank only after these integrating programmes.

The intent to integrate is supported by other data from the survey: 32% of the respondents plan to pursue joint activities with both customers and vendors in the next two years; and another 38% with customers, vendors and other partners. On the whole, 80% of the respondents plan on some joint activity with their vendors. Only a small minority of the respondents have no intention whatsoever to create joint activities with others, be it customers, vendors or others.

The bottom of the list in Table 7 also deserves attention. There are a few disconcerting things. Recent research indicates that a better integration between design and manufacturing is an essential programme of superior technology management. However, design for manufacture, or value analysis and product redesign score only at the bottom of the list. The average European manufacturer does not consider this integrated product design to be a priority for the immediate future. Is this a costly oversight? Perhaps. Particularly considering the fact that the small group of manufacturers who emphasized design for manufacture obtained a good payback, and they put it as number 4 on their list of priorities for the next two years.

What is the bottom line? We see a rather aggressive stance based on strengths in resources, which have been built up in the recent years and a restructuring of the production facilities. The competitive priorities are stable over the years and the objectives which emphasize, in the first instance, quality and reliability, are consistent with them. Action plans which aim at improving the integration of the manufacturing function within

the organization, and generally removing the barriers between manufacturing and its partners inside and outside the company seem to be the thrust for the next years.

A simple, and somewhat simplistic model of the traditional position of manufacturing is presented in Figure 2. What this figure shows is the subtle ways in which manufacturing is normally **insulated** from its environment. Inventories insulate manufacturing from its suppliers and customers. Forecasting systems, distribution, purchasing, and marketing provide additional insulating layers. Laws and regulations can shield a factory nicely from its environment; high hurdle rates for return on investments in new machinery can leave the existing machinery in the factory year after year; new products are the domain of engineering, and can enter the production floor only when all details and specifications are clear; unions can form a buffer for direct interaction with employees; competitors are kept at a distance with trade secrets. Most of this is done to protect manufacturing, to make it easier to manage. Things can then be fine-tuned and "optimized". What we now see is that such an insulated manufacturing function is losing its relevance.

This caricature of manufacturing has probably never existed. But some of its elements can be found in many European manufacturing companies. What the Manufacturing Futures data reveal is that our respondents have understood that to compete globally we need a different model. A model where manufacturing lives in symbiosis with its partners both inside and outside the company. Programmes such as just-in-time, and quality improvements jointly with the suppliers are a first step in this direction. Next, as we see in the 1990 European Manufacturing Futures data, is the germ of a bolder move: define manufacturing as a link in the integrated enterprise which combines vendors, the company and its customers in one system. Manufacturing has to prepare to remove its borders--to break through the walls it may have created around itself.

## THE HURDLES

Removing the protective layers of manufacturing can be dangerous. If the factory opens its floor to all kinds of outside influences, the entire manufacturing system could become unstable and uncontrollable.

To be successful in such a bold move, the foremost prerequisite is that a significant majority of company employees understand the direction. This is clearly not yet the case. On the question who in the company understands the strategies, goals and objectives, two-thirds of the respondents indicated that only top and middle management do so. This is insufficient. Removing the factory walls is a radical departure from past practices and needs cooperation and innovation by all.

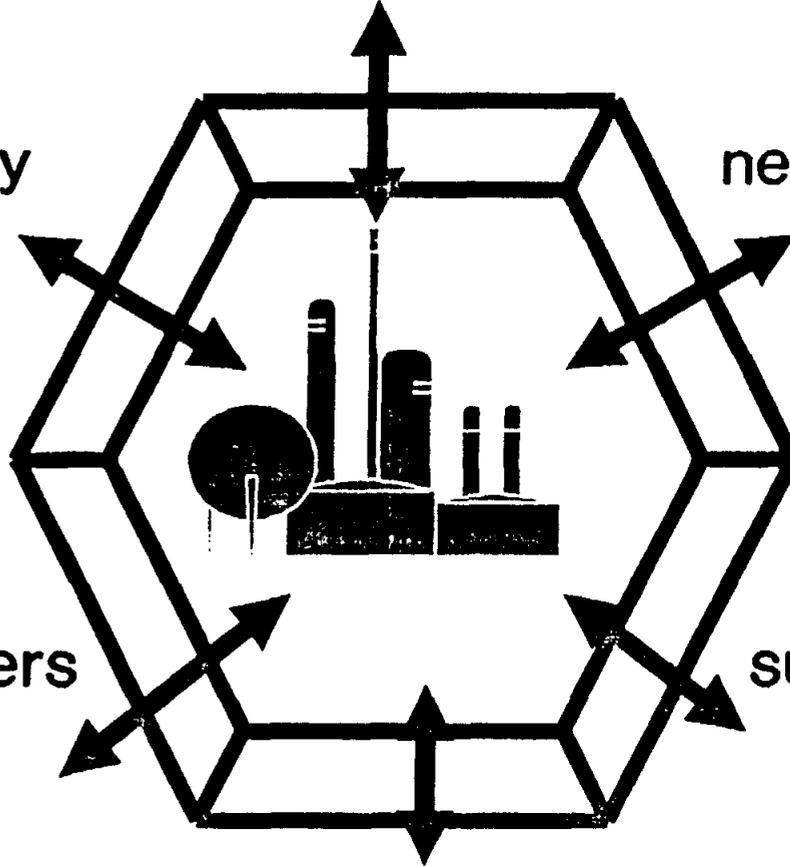
Second, the interaction between manufacturing and product design must be substantially improved. As we indicated earlier, this interface is not being managed well in the European manufacturing companies. Other data in our survey suggest that we are still far from simultaneous engineering. Process engineering on the average starts when only half of the product engineering is finished. Integrated CAD-CAM is still far off for many of our respondents. Only half have both CAD and CAM and of these, only half have some kind of integration between them. Only 10% of manufacturing personnel have had any experience in design (and vice versa). Job rotation across functional borders is not yet common practice.

**FIGURE 2**

**new processes**

**community**

**new products**



**customers**

**suppliers**

**employees**

Third, the measures for manufacturing performance must be critically re-examined. Most of the traditional measures--such as output per hour, productivity, and utilization rate--discourage removal of protective barriers. Other measures, such as on-time delivery, reduction of lead times (order, production, supplier, and other lead times), reduction of production batch sizes, reduction of inventories, speed of new product introduction and the like, should be given higher priorities. All this calls for a new accounting system for manufacturing, which is a tall order. For example, our data show that those European manufacturers who have tried to introduce Activity-Based Accounting so far have not had a high payoff (Table 2).

## CONCLUSIONS

Are the European manufacturers ready for the next challenge: removing the walls around their factories? The 1990 European Manufacturing Survey data indicate that, even in this sample of high performing manufacturers, much work still lies ahead. The hurdles are many and difficult to overcome. The process of exposing the shop floor to more and more outside influences is risky and is likely to meet much resistance in the company. The skeptics will be convinced only to the extent demonstrated by the performance of manufacturing. A small slip is likely to regress the efforts a long way. So it is a journey which needs conviction and persistence as well as care and good ideas.

But the promised benefits are also great. An agile manufacturing function which is well integrated into the business and is in direct contact with its outside partners will be a formidable competitive weapon. It will constitute a very defensible core competence which can change the nature of the competition in the industry.

Our data shows that the advanced manufacturers in our sample are taking on this challenge. In a sense, this is the natural next phase for them. After revamping the factory, the efforts on improving the quality and reliability of delivery are leading them to the obstacles around the factory. Removing these obstacles will be a difficult and time-consuming task, but those who have concrete and careful plans to go after them are likely to show success soon.

There is a risk that the European manufacturers may not pay sufficient attention to this message. Things are going well, and the excitement of the 1992 single market, confounded with the opening of Eastern European markets, can discourage bold changes in manufacturing. With so much uncertainty and turbulence in the environment, it is quite tempting to increase the protective layers around production.

But the protective layers are costly in the long run, therefore, now that things are going well, the company should risk going after developing new manufacturing capabilities. The challenge facing the senior manufacturing manager is to show that an open flow of goods, information, and people across the traditional boundaries of the manufacturing function is not only necessary to prepare for the future, but also profitable.

## APPENDIX

Since 1983, we at INSEAD have carried out an annual survey of large European manufacturing companies. The purpose of this survey is to obtain information on the current thinking of the senior manufacturing managers on the manufacturing strategy of their business units. Over the years, the results of these surveys show the trends in manufacturing strategies, action plans, deployment of production means, and the general competitiveness of European manufacturing industry.

The European Manufacturing Futures Survey is part of a larger research effort, which has been carried out in collaboration with teams from Waseda University in Tokyo and Boston University in Boston, U.S.A. Over the years, research teams from Singapore, Korea, and Australia have also joined the original group. Consequently, the unified databases of these different research teams provide a unique resource for assessing the global trends in manufacturing strategies.

The present report provides a managerial analysis of the data collected in Europe during the first quarter of 1990. For those who are interested in a complete set of data, a factbook can be obtained from the authors.

We are grateful for the longstanding collaboration with J. G. Miller at Boston University and J. Nakane at Waseda University (Tokyo). We also thank all respondents which have spent their valuable time in providing us with the information on which this paper is based.

**1990 European Manufacturing Futures Survey  
Sample Characteristics**

1. Number of respondents: 224		
of which:	consumer packaged goods	26
	industrial goods	4
	basic industries	97
	machinery	39
	electronics	52
	others	6

2. Country distribution:	
Country	N° of Respondents
Austria	4
Belgium	23
Denmark	17
Great Britain	41
Finland	8
France	36
Germany	28
Netherlands	11
Ireland	3
Italy	12
Spain	12
Switzerland	19
Sweden	7
Portugal	2

3.	1988	1990 (expected)	1992 (expected)
Manufacturing cost as a % of sales	52%	51%	50%
of which:			
- materials and components	55%	56%	57%
- direct labour	18%	18%	17%
- energy	5%	5%	5%
- manufacturing overheads	22%	22%	22%

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